

# FOREWORD

This manual covers the service procedures of the TOYOTA FORKLIFT 7FGU/7FDU35 ~ 80 series and 7FGCU35 ~ 70 series. Please use this manual for providing quick, correct servicing of the corresponding forklift models.

This manual deals with the above models as of December 2000. Please understand that disagreement can take place between the descriptions in the manual and actual vehicles due to change in design and specifications. Any change or modifications thereafter will be informed by Toyota Industrial Equipment Parts & Service News.

For the service procedures of the mounted engine, read the repair manuals listed below as reference together with this manual.

(Reference)

Repair manuals related to this manual are as follows:

TOYOTA G4 (GM6-262) ENGINE  
REPAIR MANUAL (No. C4630)

TOYOTA 11Z, 12Z, 13Z, 14Z ENGINE  
REPAIR MANUAL (No. C4615)

**TOYOTA MOTOR CORPORATION**

**Service Information Bulletins affecting Models 7FG(D)U35-80 and 7FGCU35-70**

**REV: 2/29/08**

	Title	File	File Size	Modified On
1	SIB MA04-001 Revision of Repair Manual for 7FG/DU35-80 & 7FGCU35-70	ma04-001.pdf	2739 KB	4/26/2006
2	SIB MA02-001 GM 6-262 Timing & Idle Adjustment Procedure Change	ma02-001.pdf	237 KB	5/3/2006
3	SIB FS06-001 13Z Updated Fuel System Components	fs06-001.pdf	278 KB	5/8/2006
4	SIB FS06-002 LPG Pre-Filter Service Parts	fs06-002.pdf	62 KB	5/8/2006
5	SIB CE05-004 Starter Motor Engagement Delay (All I.C. Units)	ce05-004.pdf	1018 KB	5/25/2006
6	SIB BR06-001 Stiffer Inching Pedal Spring	br06-001.pdf	77 KB	6/1/2006
7	SIB EN04-004 13Z Injection Pump Changes	en04-004.pdf	505 KB	6/7/2006
8	SIB MA05-003 Change to Periodic Replacement Parts (4Y & GM6-262)	ma05-003.pdf	45 KB	6/7/2006
9	SIB EN04-001 EPA Compliant Three Way Catalyst System Identification & New SST	en04-001.pdf	210 KB	6/7/2006
10	SIB EN03-004 Exhaust Y-Pipe Cracking	en03-004.pdf	323 KB	6/7/2006
11	SIB CE01-005 Combination Meter Membrane Grease	ce01-005.pdf	385 KB	6/8/2006
12	SIB FA06-001 Changes to Reamer Bolt Torque Specification	fa06-001.pdf	82 KB	10/18/2006
13	SIB MA07-001 Caution During Oil Filling	ma07-001.pdf	126 KB	1/31/2007
14	SIB FS07-001 New Fuel System for GM6-262	fs07-001.pdf	175 KB	1/31/2007
15	SIB MA07-001R Caution During Oil Filling	ma07-001r.pdf	190 KB	6/27/2007
16	SIB FS07-002 MIL Strategy Change	fs07-002.pdf	75 KB	6/27/2007
17	SIB FS07-003 ECM calibration revisions and DTC updates	fs07-003.pdf	163 KB	7/12/2007
18	SIB CE07-002 Wiring Diagrams for Spectrum Fuel System	ce07-002.pdf	3247 KB	9/25/2007
19	SIB ST07-002 Recommended Service Tools for a Field Service Technician	st07-002.pdf	84 KB	9/25/2007
20	SIB FS07-004 New Spectrum DTC 652 and 653	fs07-004.pdf	87 KB	10/26/2007
21	SIB FS07-008 New Spectrum DTC 9999 and 1151	fs07-008.pdf	53 KB	10/26/2007
22	SIB FS07-005 New Spectrum DTC 627, 628, and 629	fs07-005.pdf	141 KB	10/26/2007
23	SIB CE07-006 Introduction of VSCS Vehicle Speed Control System	ce07-006.pdf	741 KB	10/26/2007
24	SIB FS07-006 Spectrum Fuel System Relay Change	fs07-006.pdf	77 KB	11/16/2007
25	SIB BF08-002 Product Improvement for 7FGU/7FDU35-80, 7FGCU35-70	bf08-002.pdf	2504 KB	2/12/2008

**Technical New Briefs affecting Models 7FG(D)U35-80 and 7FGCU35-70**

1	TNB-2007-08 Troubleshooting 13Z Diesel Exhaust Smoke	tnb-2007-08.pdf	71 KB	10/26/2007
2	TNB-2005-04R2 Guidelines for Cleaning a Contaminated Hydraulic System	tnb-2005-04-r2.pdf	77 KB	10/26/2007
3	TNB-2007-02 Chassis Lubrication Clarification	tnb-2007-02.pdf	71 KB	4/9/2007
4	TNB-2007-01 Use of Torque Adapter for SSC FL06-007	tnb-2007-01.pdf	88 KB	4/9/2007
5	TNB-2003-03 7FGU35 – 80, 7FGCU35 – 70 Poor Engine Performance When Cold	tnb-2003-03.pdf	156 KB	11/29/2005
6	TNB-2005-03 Quick Reference Sheet for 13Z Diesel Pump Timing	tnb-2005-03.pdf	294 KB	11/29/2005

**Hotline Tech Tip Articles affecting Models 7FG(D)U35-80 and 7FGCU35-70**
**REV: 2/29/08**

1	HTT-11-2004 - V-6 hard start; Hydraulic valve sticking; Excessive brake wear & noise; Axle plate mounting bolts loose	hotline tech tips-2004-11.pdf	114 KB	2/6/2006
2	HTT-12-2004 - GMV6 Timing; Strobe Light Failures; V6 hard start; Drive Train Noise; Hydraulic pump failures	hotline tech tips-2004-12.pdf	130 KB	2/6/2006
3	HTT-1-2005 - Rotten Egg Smell, Retrieving TWC Error Codes, Flame Retardant Hydraulic Oil, GM V-6 Crank Pulley	hotline tech tips-2005-01.pdf	119 KB	7/5/2006
4	HTT-2-2005 - LP Pre-filter Parts, Retrieving TWC Error Codes, Hydraulic Pump Change	hotline tech tips-2005-02.pdf	153 KB	2/20/2006
5	HTT-3-2005 - "Rotten Egg" Smell; Driveline Vibration; Aisin LPG Regulator Rich/Lean Air/fuel Ratio; Abnormal Brake Noise; Diesel Engine Smoke; Overheating	hotline tech tips-2005-03.pdf	121 KB	2/6/2006
6	HTT-4-2005 - Lean LPG Main Path, Engine Compression Check; Key Switch Change	hotline tech tips-2005-04.pdf	94 KB	2/6/2006
7	HTT-5-2005 - Seat Switch Testing, Premium GM V-6 Engine; GM V-6 Crankshaft Bolt	hotline tech tips-2005-05.pdf	168 KB	7/5/2006
8	HTT-6-2005 - Injector Harness Test Light; Cascade House Valves	hotline tech tips-2005-06.pdf	326 KB	2/6/2006
9	HTT-7-2005 - TWC Initial Setting for Injector Period, Improvements to the new key switches, Operator Presence System	hotline tech tips-2005-07.pdf	118 KB	3/13/2006
10	HTT-8-2005 - TWC Initial Setting for Injector Period, Improvements To The New Key Switches, Operator Presence System	hotline tech tips-2005-08.pdf	112 KB	3/13/2006
11	HTT-9-2005 - 13Z Diesel Injection Timing	hotline tech tips-2005-09.pdf	323 KB	2/6/2006
12	HTT-10-2005 - 13Z Diesel Injection Timing	hotline tech tips-2005-10.pdf	97 KB	2/2/2006
13	HTT-11-2005 - TWC Analyzer Tips, GM V6 Hot Soak Engine Shut Down	hotline tech tips-2005-11.pdf	74 KB	2/6/2006
14	HTT-12-2005 - OPSS Component Information	hotline tech tips-2005-12.pdf	278 KB	4/9/2007
15	HTT-1-2006 - TWC Trouble Shooting Tips, Metal Clad Wiper Seals on Rear Lift Cylinders	hotline tech tips-2006-01.pdf	71 KB	2/2/2006
16	HTT-2-2006 - O.P.S.S. Error Code 1, TWC Light Strobing & Adjustments, Hood Vents, Replacement Radiators, GM V-6 Y Pipe Update	hotline tech tips-2006-02.pdf	185 KB	3/2/2006
17	HTT-3-2006 - 7Series Starter Delay Circuit	hotline tech tips-2006-03.pdf	249 KB	4/3/2006
18	HTT-4-2006 - LPG Regulator Air Testing, Home Depot Options, LPG Pre-Filter Service Parts	hotline tech tips-2006-04.pdf	84 KB	4/27/2006
19	HTT-5-2006 -7FDU Oil Filing, Cotton Core Radiator, LPG Oil Contamination	hotline tech tips-2006-05.pdf	279 KB	6/20/2006
20	HTT-6-2006 - V-Mast Rear Cylinders, Wire Harness Repair, SAS Code 63, Axle Mount Bolts	hotline tech tips-2006-06.pdf	344 KB	7/11/2006
21	HTT-7-2006 - GM6-262 Exhaust Y-Pipe Breaking	hotline tech tips-2006-07.pdf	131 KB	4/9/2007
22	HTT-8-2006 -Engine Shutdown Option, Extreme Environment Radiator	hotline tech tips-2006-08.pdf	268 KB	9/6/2006
23	HTT-9-2006 - V-Mast Cylinder Spacer, GM6-262 Timing Chain Tensioner, TWC Tamper Resistant Plug	hotline tech tips-2006-09.pdf	134 KB	10/3/2006
24	HTT-10-2006 - GM6-262 Hard/Impossible to Start, SAS L-Off	hotline tech tips-2006-10.pdf	257 KB	4/9/2007
25	HTT-11-2006 - Ultra-Low Sulfur Diesel, 7FGCU35-45 Brake Noise, TWC Emission Warranty	hotline tech tips-2006-11.pdf	99 KB	11/27/2006
26	HTT-12-2006 - Travel Speed Measurement, Clogged LP injector, New Fuel System SST	hotline tech tips-2006-12.pdf	308 KB	4/9/2007
27	HTT-1-2007 - GM6-262 Spectrum Fuel System	hotline tech tips-2007-01.pdf	136 KB	4/9/2007
28	HTT-2-2007 - Spectrum MIL Strategy change, Chassis Lubrication, USB adapter for Spectrum	hotline tech tips-2007-02.pdf	519 KB	4/9/2007
29	HTT-3-2007 - IC Radiator Offerings	hotline tech tips-2007-03.pdf	154 KB	4/9/2007
30	HTT-4-2007 - Spectrum Adapter hardware change	hotline tech tips-2007-04.pdf	381 KB	5/10/2007
31	HTT-5-2007 - Spectrum Fuel System Terminology	hotline tech tips-2007-05.pdf	216 KB	9/24/2007
32	HTT-6-2007 - New Active Radiator, Troubleshooting Smoke	hotline tech tips-2007-06.pdf	162 KB	9/24/2007
33	HTT-7-2007 - New Hydraulic Oil, Troubleshooting Overheating, Spectrum III LP and/or Gasoline	hotline tech tips-2007-07.pdf	600 KB	9/24/2007
34	HTT-9-2007 - Spectrum Fuel System Calibration	hotline tech tips-2007-09.pdf	502 KB	9/24/2007
35	HTT-10-2007 - LP Lockoff Solenoid Orientation	hotline tech tips-2007-10.pdf	303 KB	10/30/2007
36	HTT-11-2007 - Spectrum Calibration changes, Spectrum DTC 1152	hotline tech tips-2007-11.pdf	155 KB	11/19/2007
37	HTT-12-2007 - Spectrum hard start, Engine Block Heaters	hotline tech tips-2007-12.pdf	490 KB	12/12/2007
38	HTT-1-2008 - Threshold Voltages	hotline tech tips-2008-01.pdf	363 KB	1/28/2008
39	HTT-2-2008 - Proper Wheel Torque	hotline tech tips-2008-02.pdf	204 KB	2/28/2008

# SECTION INDEX

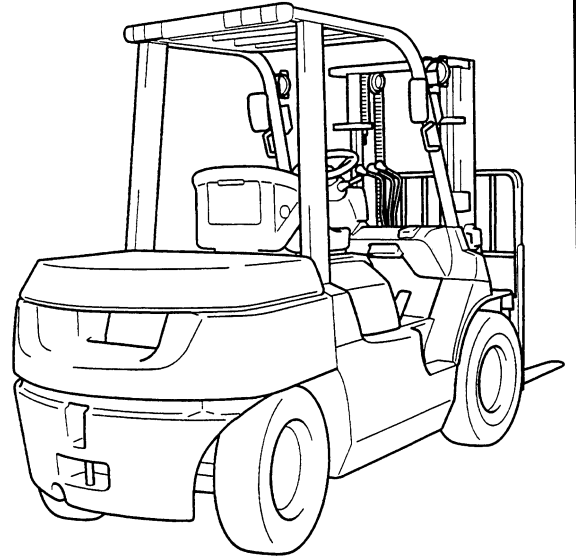
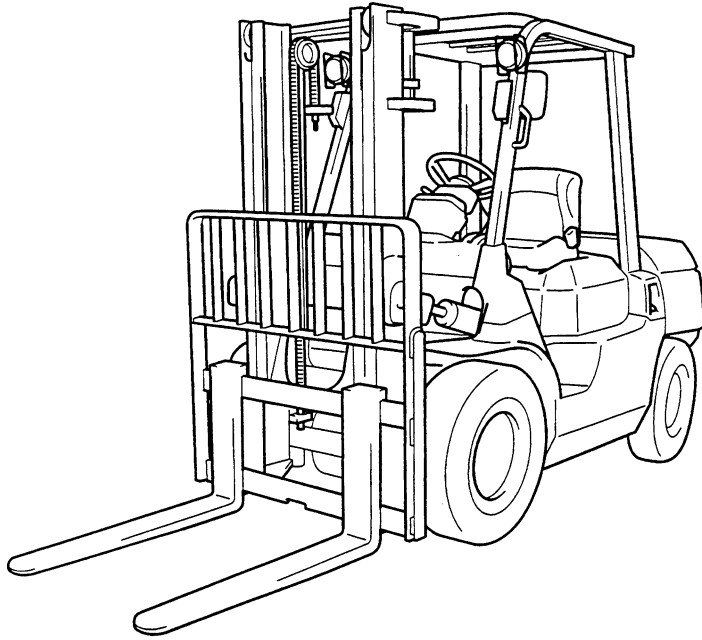
NAME	SECTION
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<b>ENGINE</b>	<b>1</b>
<b>TORQUE CONVERTER &amp; TRANSMISSION</b>	<b>2</b>
<b>PROPELLER SHAFT</b>	<b>3</b>
<b>DIFFERENTIAL</b>	<b>4</b>
<b>FRONT AXLE</b>	<b>5</b>
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# GENERAL

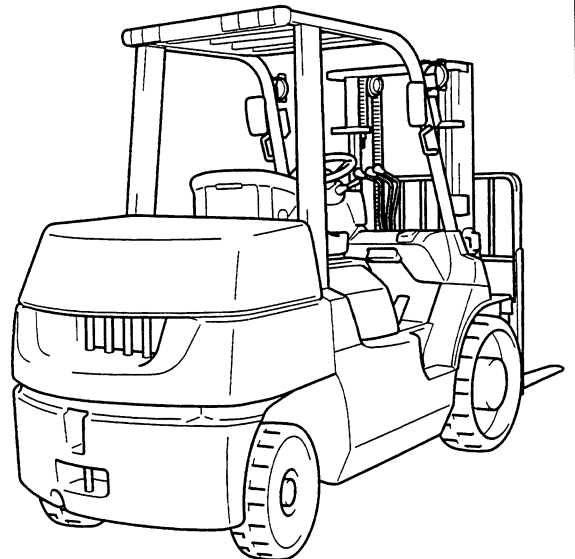
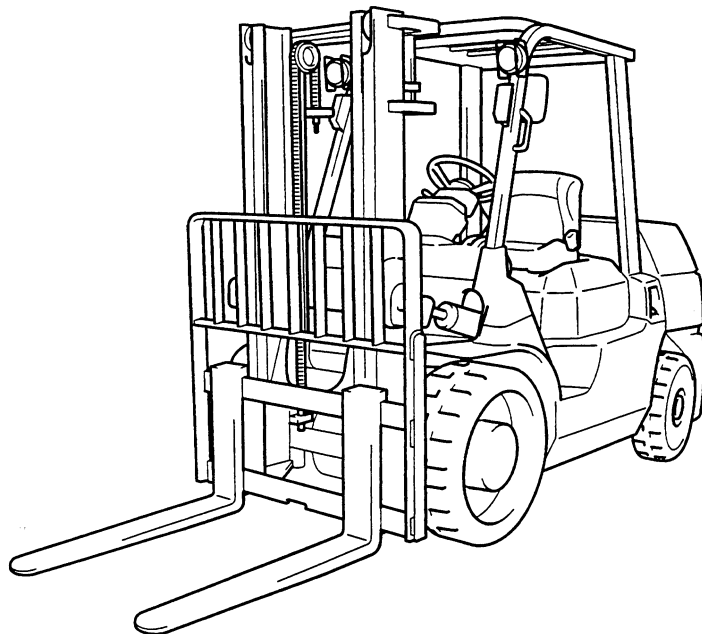
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# EXTERIOR VIEWS

Pneumatic tire model



Cushion tire model



## VEHICLE MODEL

### Pneumatic Tire Models (Pn)

Classification		Load Capacity	Vehicle Model	Transmission Type	Engine	
Series	Model					
Pn3.5 ton series	Pn35	8000 lbs	7FGU35	TIC	G4 (GM6-262)	Gasoline
			7FDU35	TIC	132	Diesel
	Pn40	9000 lbs	7FGKU40	TIC	G4 (GM6-262)	Gasoline
			7FDKU40	TIC	13Z	Diesel
Pn4.5 ton series	Pn45	10000 lbs	7FGU45	TIC	G4 (GM6-262)	Gasoline
			7FDU45	TIC	132	Diesel
	Pn50	11000 lbs	7FGAU50	TIC	G4 (GM6-262)	Gasoline
			7FDAU50	TIC	132	Diesel
Pn6.0 ton series	Pn60	13500 lbs	7FGU60	TIC	G4 (GM6-262)	Gasoline
			7FDU60	TIC	132	Diesel
	Pn70	15500 lbs	7FGU70	TIC	G4 (GM6-262)	Gasoline
			7FDU70	TIC	132	Diesel
	Pn80	17500 lbs	7FGU80	TIC	G4 (GM6-262)	Gasoline
			7FDU80	TIC	132	Diesel

### Cushion Tire Models (Cu)

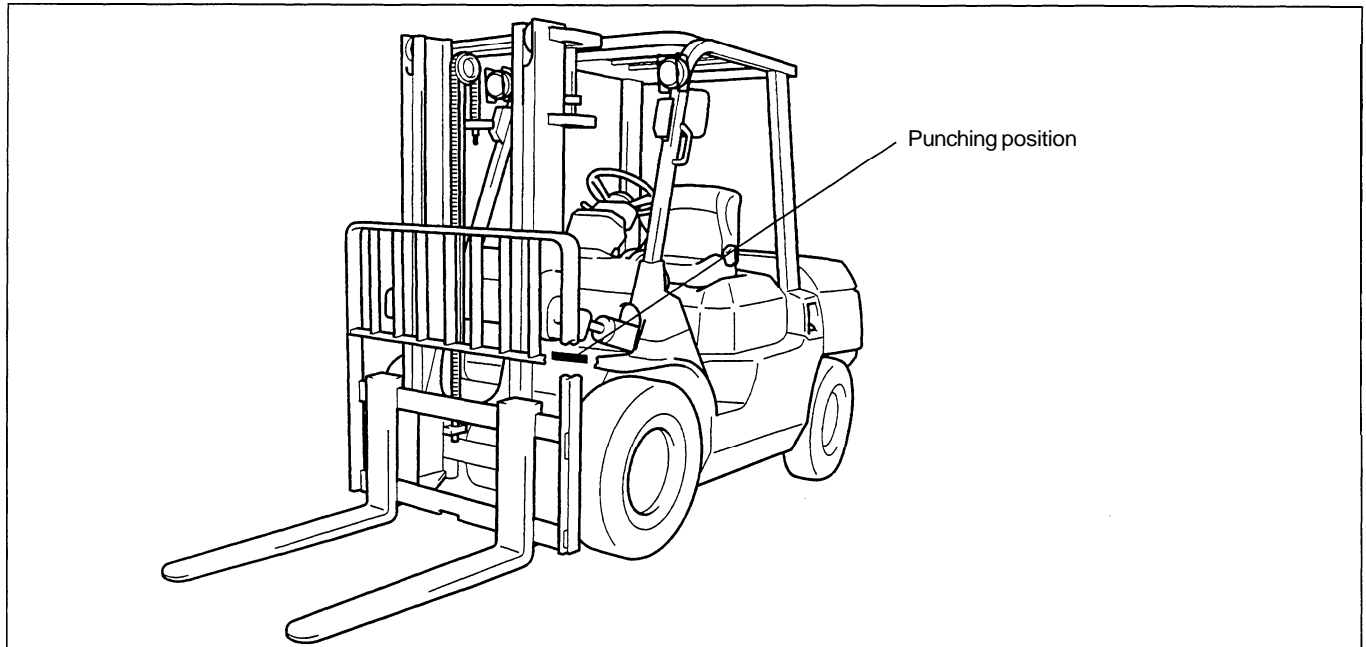
Classification		Load Capacity	Vehicle Model	Transmission Type	Engine	
Series	Model					
Cu3.5 ton series	Cu35	8000 lbs	7FGCU35	T/C	G4 (GM6-262)	Gasoline
	Cu45	10000 lbs	7FGCU45	TIC	G4 (GM6-262)	Gasoline
Cu5.5 ton series	Cu55	12000 lbs	7FGCU55	TIC	G4 (GM6-262)	Gasoline
	Cu60	13500 lbs	7FGCU60	TIC	G4 (GM6-262)	Gasoline
	Cu70	15500 lbs	7FGCU70	TIC	G4 (GM6-262)	Gasoline

**Note:**

The G4 engine is the same as the GM6-262 engine except for the nomenclature.

## FRAME NUMBER

### Frame No. Punching Position



	Series	Engine	Vehicle model	Punching format
Pneumatic tire	3.5 ton series	G4 (GM6-262)	7FGU35	7FGKU40 - 60011
			7FGKU40	
		13Z	7FDU35	7FDKU40 - 60011
			7FDKU40	
	4.5 ton series	G4 (GM6-262)	7FGU45	7FGAU50 - 60011
			7FGAU50	
		132	7FDU45	7FDAU50 - 60011
			7FDAU50	
	6.0 ton series	G4 (GM6-262)	7FGU60	7FGU80 - 60011
			7FGU70	
7FGU80				
132		7FDU60	7FDU80 - 60011	
		7FDU70		
		7FDU80		
Cushion tire	3.5 ton series	G4 (GM6-262)	7FGCU35	7FGCU45 - 60011 * 7FGCU45 © 60011
			7FGCU45	
	5.5 ton series	G4 (GM6-262)	7FGCU55	7FGCU70 - 60011
			7FGCU60	
			7FGCU70	
			7FGCU70	

\*: EEC spec.



# HOW TO USE THIS MANUAL

## EXPLANATION METHOD

### 1. Operation procedure

(1) The operation procedure is described in either pattern A or pattern B below.

Pattern A: Explanation of each operation step with illustration.

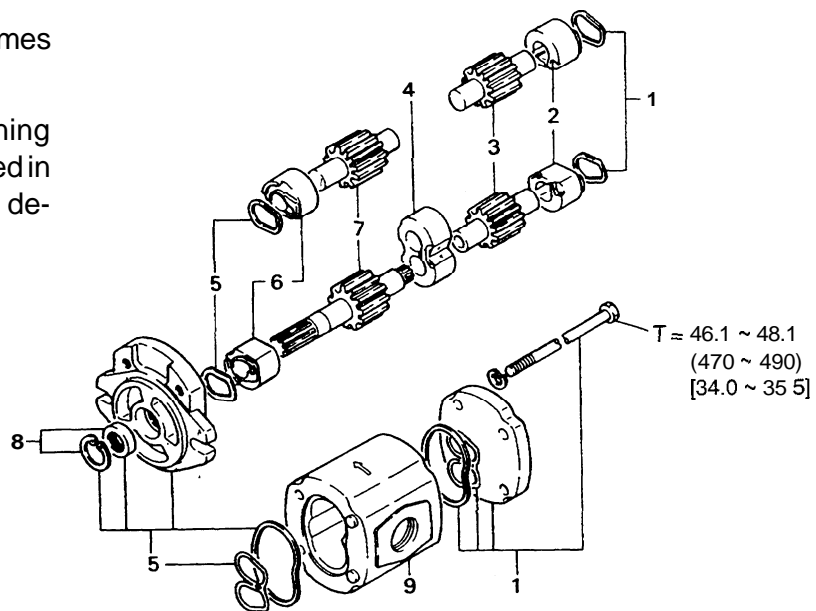
Pattern B: Explanation of operation procedure by indicating step numbers in one illustration, followed by explanation of cautions and notes summarized as point operations.

Example of description in pattern B

0

### DISASSEMBLY-INSPECTION-REASSEMBLY Tightening torque unit T = N·m (kgf·cm) [ft·lbf]

- Step Nos. are partially sometimes omitted in illustrations.
- When a part requiring tightening torque instruction is not indicated in the illustration, the part name is described in the illustration frame.



### Disassembly Procedure

- 1 Remove the cover. **[Point 1]**
- 2 Remove the bushing **[Point 2]** ← Operation explained later
- 3 Remove the gear.

### Point Operations Explanation of key point for operation with an illustration

#### **[Point 1]**

Disassembly: Put a match mark when removing the pump cover.

#### **[Point 2]**

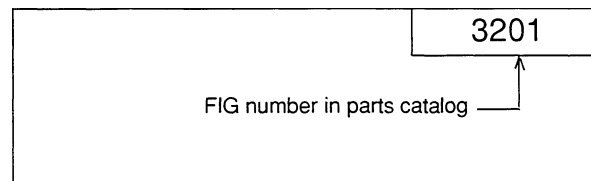
Inspection: Measure the bushing inside diameter.

**Limit: 19.12 mm (0.7528 in)**

## 2. How to read components figures

- (1) The components figure uses the illustration in the parts catalog for the vehicle model. Please refer to the catalog for checking the part name.  
The number at the right shoulder of each components figure indicates the Fig. number in the parts catalog.

(Example)



## 3. Matters omitted in this manual

- (1) This manual omits description of the following jobs, but perform them in actual operation:
- ① Cleaning and washing of removed parts as required
  - ② Visual inspection (partially described)

## TERMINOLOGY

### Caution:

**Important matters of which negligence may cause hazards on human body. Be sure to observe them.**

### Note:

**Important items of which negligence may cause breakage or breakdown, or matters in operation procedure requiring special attention.**

Standard: Values showing allowable range in inspection and adjustment.

Limit: Maximum or minimum allowable value in inspection or adjustment.

## ABBREVIATIONS

Abbreviation(code)	Meaning	Abbreviation(code)	Meaning
ASSY	Assembly	SAE	Society of Automotive Engineers (USA)
Cu	Cushiontire models	SAS	System of active stability
LH	Left hand	SST	Special service tool
LLC	Long life coolant	STD	Standard
M/T	Manual transmission	T =	Tighteningtorque
NMR	No-load maximum speed	TIC	Torque converter & transmission
OPT	Option	O O T	Number of teeth (○ O)
O/S	Oversize	U/S	Undersize
Pn	Pneumatictire models	W/	With
PS	Power steering	L/	Less
RH	Right hand		

## OPERATIONAL TIPS

### 1. Safe operation

- (1) After jacking up, always support with wooden blocks or rigid stands.
- (2) When hoisting the vehicle or its heavy component, use wire rope(s) with a sufficient reserve in load capacity.
- (3) Always disconnect the battery terminal before the inspection or servicing of electrical parts.

### 2. Tactful operation

- (1) Prepare the mechanic tools, necessary measuring instruments (circuit tester, megger, oil pressure gauge, etc.) and SSTs before starting operation.
- (2) Before disconnecting wiring, always check the cable color and wiring state.
- (3) When overhauling functional parts, complicated portions or related mechanisms, arrange the parts neatly to prevent confusion.
- (4) When disassembling and inspecting such a precision part as the control valve, use clean tools and operate in a clean location.
- (5) Follow the described procedures for disassembly, inspection and reassembly.
- (6) Replace, gaskets, packings and O-rings with new ones each time they are disassembled.
- (7) Use genuine Toyota parts for replacement.
- (8) Use specified bolts and nuts. Observe the specified tightening torque at the time of reassembly. Tighten to the center of the specified tightening torque range.  
If no tightening torque is specified, tighten the bolt or nut according to the standard tightening torque table.

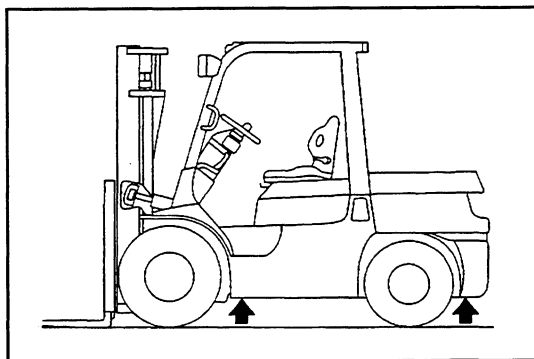
### 3. Grasping the trouble state

When a trouble occurs, do not attempt immediate disassembly or replacement but first check if the trouble requires disassembly or replacement for remedying.

### 4. Disposal of waste fluid, etc.

When draining waste fluid from the vehicle, receive it in a container.

If any oil, fuel, coolant, oil filter, battery or other harmful substance is directly discharged or scrapped without permission, it will either adversely affect human health or destroy the environment. Always sort waste fluids, etc. and treat them properly by requesting disposal by specialized companies.



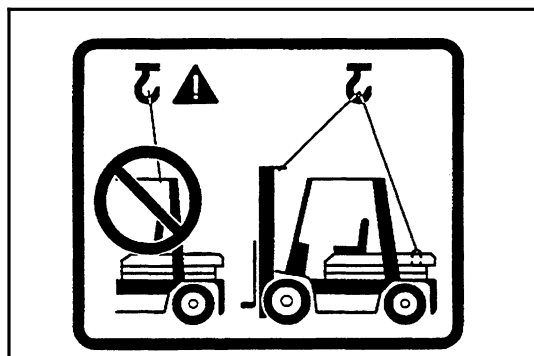
### 5. Jack up points

Front side:

Jack up at the bottom surface of the frame.

Rear side:

Jack up at the under the counterweight.



## HOISTING THE VEHICLE

When hoisting the vehicle, sling with wire rope(s) at the mast hook holes and the counterweight hook holes.

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## ATTENTIVE POINTS ON SAS

1. Reference should be made to separate manual "New Model Feature 7FG(C)U/7FDU35-80 Pub. No.PU017" for the explanations of SAS functions and operations.
2. Read Section 15 SAS "Precautions for Repair" on Page 15-8 in this repair manual in advance.
3. Whenever the repair or replacement is performed to the place where relative to SAS function, re-setting procedure by which the SAS regain proper function must be performed. (See Page 15-23)
4. The warning on the SAS caution label must be confirmed when the modification or change is such as to change the original specification.  
If improper, change the label. (See Page 15-11)
5. Care should always be exercised for safety operation whenever you operate the truck.  
Make distinction between the SAS featured trucks and those of none, because the control features are different.
6. The SAS oil control valves comprise many precision valves. Since dirty or contaminated hydraulic oil will adversely affect the functions of these valves, always wash the parts clean at the time of installation after disassembly or for replacement of hydraulic parts (valves, piping, etc.). Periodic replacement of the hydraulic oil is very important.
7. Since this vehicle uses high-precision electronic devices, modification of electrical parts may cause faults. Always use genuine Toyota parts when replacing or installing electrical parts (auxiliary equipment, optional parts, etc.).

## CIRCUIT TESTER

Circuit testers are available in both the analog and digital types. They should be used selectively according to the purpose of measurement.

Analog type: This type is convenient for observing movement during operation, but the measured value should only be used for reference or rough judgement.

Digital type: Fairly accurate reading is possible, but it is difficult to observe the variation or movement.

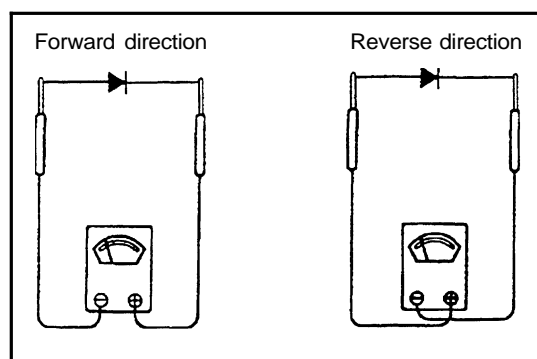
### 1. Difference in measurement results with the digital type and analog type

- \* The result may be different between measurements with the analog type and digital type.

Always use a circuit tester according to its operation manual.

Cautions when the polarities are different between the analog type and digital type are described below.

#### (1) Analog circuit tester

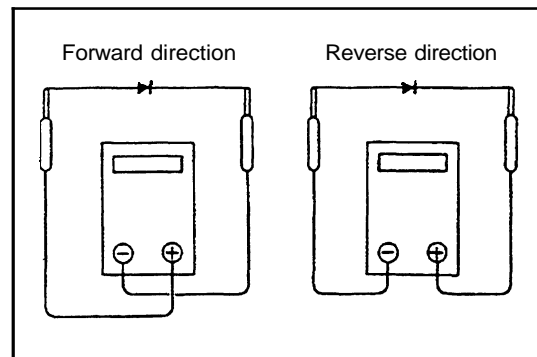


#### Measurement result example

Tester range:  $k\Omega$  range

	Analog type
Forward	Continuity exists
	11 $k\Omega$
Reverse	No continuity
	$\infty$

#### (2) Digital circuit tester



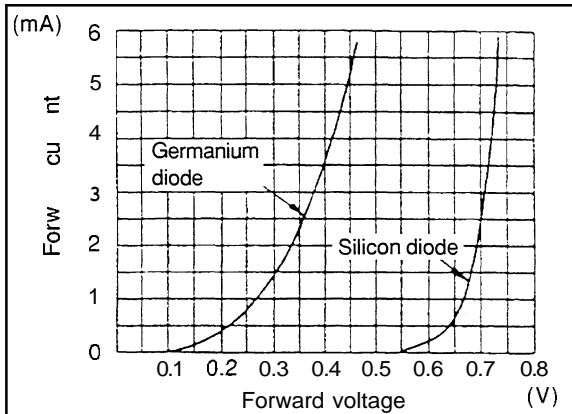
#### Measurement result example

Tester range:  $M\Omega$  range

	Digital type
Forward	No continuity
	1
Reverse	Continuity exists
	2 $M\Omega$

2. Difference in result of measurement with circuit tester

The circuit tester power supply voltage depends on the tester type. 1.5 V, 3.0 V or 6.0 V is used. The resistance of a semiconductor such as a diode varies with the circuit tester power supply voltage. The diode characteristics are shown in the figure below.

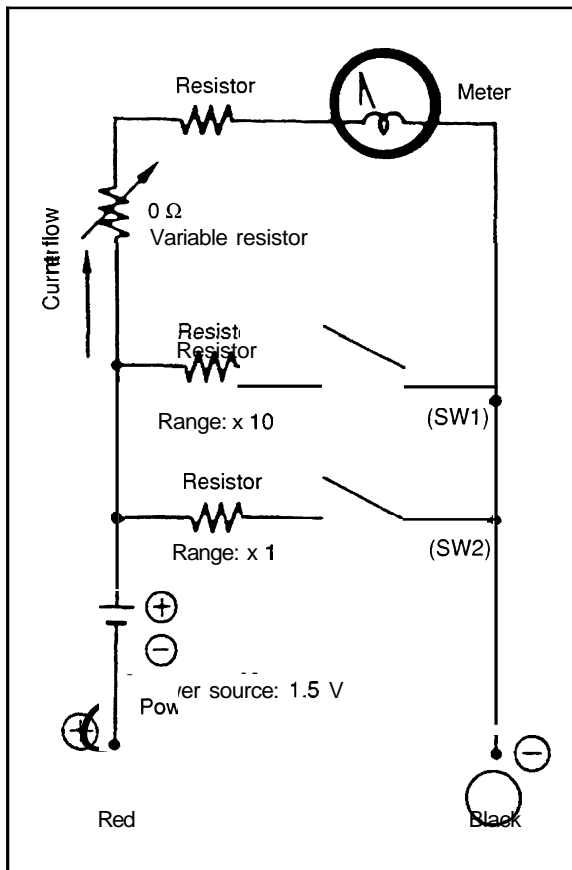


The resistance values of the same semiconductor measured with two types of circuit testers having different power supply voltages are different.

This manual describes the results of measurement with a circuit tester whose power supply voltage is 3.0 V.

3. Difference in measurement result by measurement range (analog type)

In the analog type circuit tester, changing the measurement range switches over the internal circuit to vary the circuit resistance. Even when the same diode is measured, the measurement result varies with the measurement range.



Always use the range described in the repair manual for measurement.








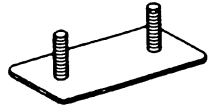
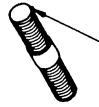

# STANDARD BOLT & NUT TIGHTENING TORQUE

Standard bolt and tightening torques are not indicated.  
Judge the standard tightening torque as shown below.

1. Find out the type of the bolt from the list below and then find the bolt tightening torque from the table.
2. The nut tightening torque can be judged from the mating bolt type.

## BOLT STRENGTH TYPE IDENTIFICATION METHOD

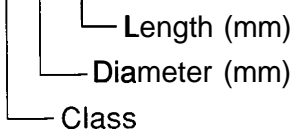
### IDENTIFICATION BY BOLT SHAPE

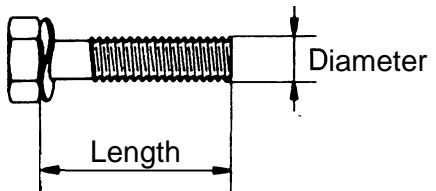
	Shape and class	Class
Hexagon head bolt	 Bolt head No.	4 = 4T 5 = 5T 6 = 6T 7 = 7T 8 = 8T
	 No mark	4T
Hexagon flange bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T
Welded bolt		4T
Stud bolt	 No mark	4T
	 Grooved	6T

### IDENTIFICATION BY PART NO.

**Hexagon head bolt**

Parts No. 91611-40625

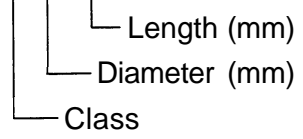


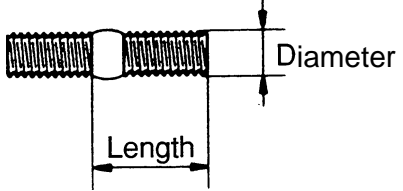


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**Stud bolt**

Part No. 92132-40614

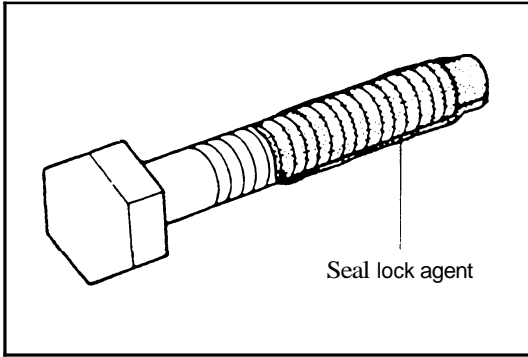




**TIGHTENING TORQUE TABLE**

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt 			Hexagon flange bolt 		
			N•m	kgf-cm	ft-lbf	N•m	kgf-cm	ft-lbf
4T	6	1.0	5.4	55	48 in-lbf	5.9	60	52 in-lbf
	8	1.25	13	130	9	14	145	10
	10	1.25	25	260	19	28	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	75	760	55	83	850	61
	16	1.5	113	1150	83	—	—	—
5T	6	1.0	6.4	65	56 in-lbf	7.5	75	65 in-lbf
	8	1.25	16	160	12	18	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1050	76
	16	1.5	137	1400	101	157	1600	116
6T	6	1.0	7.8	80	69 in-lbf	8.8	90	78 in-lbf
	8	1.25	19	195	14	21	215	16
	10	1.25	38	400	29	43	440	32
	12	1.25	72	730	53	79	810	59
	14	1.5	110	1100	80	123	1250	90
	16	1.5	170	1750	127	191	1950	141
7T	6	1.0	11	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	103	1050	76
	14	1.5	147	1500	108	167	1700	123
	16	1.5	226	2300	166	—	—	—
8T	6	1.0	12	125	9	14	145	9
	8	1.25	29	300	22	32	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	108	1100	80	123	1250	90
	14	1.5	172	1750	127	196	2000	145
	16	1.5	265	2700	195	299	3050	221





## PRECOAT BOLTS

(Bolts with seal lock agent coating on threads)

1. Do not use the precoat bolt as it is in either of the following cases:
  - (a) After it is removed.
  - (b) When the precoat bolt is moved (loosened or tightened) by tightness check, etc.

### Note:

**For torque check, use the lower limit of the allowable tightening torque range. If the bolt moves, re-tighten it according to the steps below.**


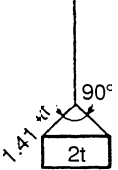
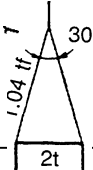
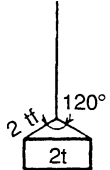
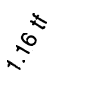
2. Method for reuse of precoat bolts
  - (1) Wash the bolt and threaded hole. (The threaded hole must be washed even for replacement of the bolt.)
  - (2) Perfectly dry the washed parts by air blowing.
  - (3) Coat the specified seal lock agent to the threaded portion of the bolt.

## HIGH PRESSURE HOSE FITTING TIGHTENING TORQUE

1. When connecting a high pressure hose, wipe the hose fitting and mating nipple contact surfaces with clean cloth to remove foreign matters and dirt. Also check no dent or other damage on the contact surfaces before installation.
2. When connecting a high pressure hose, hold the hose to align the fitting with the nipple and tighten the fitting.
3. The maximum tightening torque must not exceed twice the standard tightening torque.

Nominal diameter of screw	Standard tightening torque N·m (kgf·cm) [ft·lbf]		Hose inside diameter mm (in)
	Standard	Tightening range	
7/16 — 20UNF	25 ( 250) [ 18.11	24 ~ 26 ( 240 ~ 270) [17.4 ~ 19.5]	6 (0.24)
9/16 — 18UNF	49 ( 500) [ 36.21	47 ~ 52 ( 480 ~ 530) [34.7 ~ 38.31	9 (0.35)
3/4 — 16UNF	59 ( 600) [ 43.41	56 ~ 62 ( 570 ~ 630) [41.2 ~ 45.61	12 (0.47)
7/8 — 14UNF	59 ( 600) [ 43.41	56 ~ 62 ( 570 ~ 630) [41.2 ~ 45.61	12 (0.47), 15 (0.59)
1-1/16 — 12UNF	118 (1200) [ 86.81	112 ~ 123 (1140 ~ 1250) [82.5 ~ 90.41	19 (0.75)
1-5/16 — 12UNF	137 (1400) [101.3]	130 ~ 144 (1330 ~ 1470) [96.2 ~ 106.41	25 (0.98)
PF1/4	25 ( 250) [ 18.1]	24 ~ 26 ( 240 ~ 270) [17.4 ~ 19.51	6 (0.24)
PF3/8	49 ( 500) [ 36.2]	47 ~ 52 ( 480 ~ 530) [34.7 ~ 38.31	9 (0.35)
PF1/2	59 ( 600) [ 43.41	56 ~ 62 ( 570 ~ 630) [41.2 ~ 45.61	12 (0.47)
PF3/4	118 (1200) [ 86.81	112 ~ 123 (1140 ~ 1250) [82.5 ~ 90.41	19 (0.75)
PF1	137 (1400) [101.31	130 ~ 144 (1330 ~ 1470) [96.2 ~ 106.4]	25 (0.98)

## WIRE ROPE SUSPENSION ANGLE LIST

Lifting angle	Tension	Compression	Suspension method	Lifting angle	Tension	Compression	Suspension method
0°	1.00 time	0 time		90°	1.41 time	1.00 time	
30°	1.04 time	0.27 time		120°	2.00 time	1.73 time	
60°	1.16 time	0.58 time					

## SAFE LOAD FOR EACH WIRE ROPE SUSPENSION ANGLE unit: N (tf) [lbf]

Rope diameter	Cutting load	Single-rope suspension	Two-rope suspension				Four-rope suspension			
		0°	0°	30°	60°	90°	0°	30°	60°	90°
6 mm (0.24 in)	21380 (2.18) [4807]	3040 (0.31) [683.6]	6080 (0.62) [1367]	5880 (0.6) [1323]	5200 (0.53) [1169]	4310 (0.44) [970]	12160 (1.24) [2734]	11770 (1.2) [2646]	10400 (1.06) [2337]	8630 (0.88) [1940]
8 mm (0.32 in)	31480 (3.21) [7078]	4410 (0.45) [992.3]	8830 (0.9) [1985]	8530 (0.87) [1918]	7650 (0.78) [1720]	6280 (0.64) [1411]	17650 (1.8) [3969]	17060 (1.74) [3937]	15300 (1.561) [3440]	12550 (1.28) [2322]
10 mm (0.4 in)	49230 (5.02) [11.69]	6960 (0.71) [1565.61]	14020 (1.43) [3153]	13440 (1.37) [3021]	11770 (1.2) [2646]	9810 (1.0) [2205]	27460 (2.8) [6174]	26480 (2.7) [5954]	23540 (2.4) [5292]	19610 (2.0) [4410]
12.5 mm (0.5 in)	76880 (7.84) [17387]	10980 (1.12) [2469.5]	21570 (2.2) [4851]	21280 (2.1) [4631]	18630 (1.9) [4190]	14710 (1.5) [3308]	43150 (4.4) [9702]	41190 (4.2) [9261]	37270 (3.8) [8379]	29420 (3.0) [6615]
14 mm (0.56 in)	96400 (9.83) [21675]	13730 (1.4) [3087]	27460 (2.8) [6174]	26480 (2.7) [5954]	23540 (2.4) [5292]	18630 (1.9) [4190]	54920 (5.6) [12348]	52960 (5.4) [11907]	47070 (4.8) [10584]	37270 (3.8) [8379]

## COMPONENTS WEIGHT

Component		Weight    kg (lb)
Engine	G4 (GM6-262)	185 ( 408)
	13Z	325 ( 717)
Torque converter & transmission	Pn35 ~ 50, Cu35 ~ 70 model	150 ( 331)
	Pn60 ~ 80 model	170 ( 375)
Counter weight	Pn35 model	Approx. 2230 ( 4920)
	Pn40 model	Approx. 2630 ( 5800)
	Pn45 model	Approx. 2880 ( 6350)
	Pn50 model	Approx. 3130 ( 6950)
	Pn60 model	Approx. 3430 ( 7565)
	Pn70 model	Approx. 4110 ( 9065)
	Pn80 model	Approx. 4790 (10565)
	Cu35 model	Approx. 2370 ( 5225)
	Cu45 model	Approx. 3120 ( 6880)
	Cu55 model	Approx. 3500 ( 7720)
	Cu60 model	Approx. 3920 ( 8645)
	Cu70 model	Approx. 4570 (10080)
V mast ASSY Ubackrest and fork (with lift cylinder, max. lifting height: 3000 mm (118 in))	Pn35.40 model	Approx. 890 ( 1960)
	Pn45 model	Approx. 1140 ( 2510)
	Pn50 model	Approx. 1270 ( 2800)
	Pn60.70 model	Approx. 1340 ( 2950)
	Pn80 model	Approx. 1340 ( 2950)
	Cu35 model	Approx. 890 ( 1960)
	Cu45 model	Approx. 950 ( 2090)
	Cu55 model	Approx. 1270 ( 2800)
	Cu60-70 model	Approx. 1340 ( 2950)

## RECOMMENDED LUBRICANT QUANTITY & TYPES

Description		Application	Quantity ℓ (US gal)	Classification	Type
Engine	Gasoline	G4 (GM6-262)	4.2 (1.11)	API SH, SJ	Motor oil SAE30 (SAE20 in cold area)  SAE20W-40 (SAE10W-30 in cold area)
	Diesel	13Z	12.5 (3.30)	API CE, CF	Diesel engine oil SAE30 (SAE20 in cold area)  SAE10W-30
Transmission		T/C	12.0 (3.17)	ATF	GM Dexron® II
Differential	Pn35-50 models		9.0 (2.38)	API GL-4, GL-5	Hypoid gear oil SAE85W-90
	Pn60-80 models		7.0 (1.85)		
	Cu35~70 models				
Hydraulic oil (V mast, max. lifting height 3000mm (118in))	Pn35-80, Cu55~70 models		69 (18.2)	ISO VG32	Hydraulic oil
	Cu35-45 models		38 (10.0)		
Fuel tank	Pn35-40, Cu55-70 models		105 (27.7)	—	—
	Pn45-80 models		120 (31.7)		
	Cu35-45 models		48 (12.7)		
Chassis parts	All models		Proper quantity	—	<ul style="list-style-type: none"> <li>• MP grease</li> <li>• Molybdenum disulfide grease</li> </ul>
Coolant (excluding reservoir tank)	G4 (GM6-262)		13.0 (3.46)	LLC	<ul style="list-style-type: none"> <li>• LLC 30-50% mixture (for winter or all-season)</li> <li>• Coolant with rust-inhibitor (for spring, summer and autumn)</li> </ul>
	13Z		13.0 (3.46)		
Coolant (Reservoir Tank)	All models		0.6 (0.16) (at Full level)	↑	↑